651.1390 Appendix 13E—Example Agricultural Waste Management System Plan

Appendix 13E Example Agricultural Waste Management System Plan

Agricultural Waste Management System Plan for the Green Dairy

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General

The agricultural waste management system for the Joe Green Dairy was planned and designed at the request and with the involvement of Mr. Joe Green. The plan is based on decisions and choices made by him. The system is planned to manage waste generated by the dairy in a manner that prevents or minimizes degradation of soil, water, air, plant, and animal resources and protects public health and safety. It is also planned to preclude discharge of pollutants to surface water from a 25-year, 24-hour storm event, to minimize ground water contamination, and to recycle the waste produced through soil and crops to the fullest extent possible.

The Natural Resources Conservation Service plans agricultural waste management systems viewed as having one or more of six functions. These functions are production, collection, transfer, storage, treatment, and utilization. Each of these functions is involved in the system planned for the Joe Green Dairy. The operation, maintenance, and safety requirements for the system presented in this plan are organized by these functions.

System description

The agricultural waste management system was planned to accommodate waste from a herd of 800 Holstein dairy livestock and wastewater from the milk parlor and milk house. The system is planned to divert clean water from the system with roof gutters and downspouts, to collect the manure from the freestall barn with flush alleys in a reception pit, to treat the wastewater with a solid/liquid separator, to store manure and wastewater in a waste storage pond, to transfer the wastewater in a pipeline from the waste storage pond to fields where it will be land applied, and to utilize the waste on 450 acres of pastures.

Decisionmaker’s responsibilities

Mr. Green is responsible for the proper installation, operation, and maintenance of the waste management system. Although the system was designed by the Natural Resources Conservation Service using the best available technology, it needs to be inspected and properly operated and maintained in a safe manner if it is to operate as planned and designed.

Mr. Green is also responsible for obtaining a permit from the Oregon Department of Agriculture and all other necessary permits to operate the system. The system must be operated and maintained in accordance with these permits and other laws and regulations that pertain to its operation including the Oregon Occupational Safety and Health Code for Agricultural Operations and Farming. All personnel must be trained or informed of the safety and the operation and maintenance requirements for the system.

An inventory of equipment related to each function will be made and checklists developed, as necessary, for preventive maintenance and inspection. A supply of spare parts necessary to keep the system operating will be kept on hand. Nameplate data, reference manuals, catalogs, drawings, and other manufacturers' information necessary to operate and maintain the equipment used in the system will be kept. A record will be kept of hours of operation for system equipment that is routinely maintained on a time-used basis.

Component installation schedule

The system components will be installed according to the following schedule:

Component	Installation date
Reception pit	5/99
Roof gutters and downspouts	7/99
Solid/liquid separator (including storage pad)	10/99
Waste storage pond	6/00
Transfer pipeline	9/00

Production function requirements

The production function of an AWMS relates to the amount of waste produced within the system. The system design was based on waste production estimates for 800 Holstein dairy livestock, which includes 500 milk cows, 150 dry cows, and 150 heifers. Exceeding either the number or type of livestock may invalidate the design for the system. The system was designed based on a daily manure production of 1,336 cubic feet per day and milk house and milk parlor wastewater production of 420 cubic feet per day. The amount of manure and wastewater produced must be monitored to assure that it does not exceed these design volumes. These volumes can be estimated using the staff gauge readings and the stage storage curve for the waste storage pond. Production rates that exceed those estimated in design will result in premature filling of the waste storage pond.

The system was designed assuming that roof water would be excluded from the system. For this reason the roof gutter and downspout system on the barn must be maintained. The gutters and downspouts will be inspected during rainstorms to check for leaks and clogs. If found, the gutters and downspouts must be repaired. The gutters must be cleaned of debris annually. The protective coatings on the gutters should be inspected at this time and repaired if necessary.

Production function safety items include maintaining ventilation to prevent the buildup of gases within the freestall barn. Workers must be informed of the danger of gases and the necessity of keeping vents open at all times, even during cold weather.

Collection function requirements

The collection function pertains to the capture and gathering of manure and wastewater so it can be further managed. Manure is collected from a freestall barn with flush alleys. Temporary storage is provided by a below-ground, reinforced concrete reception pit. Flush water used in the system is recycled from the waste storage pond. Flush tanks are filled using a pump and pipeline. The pump enclosure will be maintained to prevent exposure to the elements. Pump maintenance will be according to the manufacturer's recommendations. Pump safety features will be maintained. The flushing operation will be monitored for effectiveness in moving the manure to the reception pit. The frequency and/or duration of flushing will be adjusted as necessary.

The grates and covers for the reception pit must remain secured in place except for maintenance purposes. During maintenance, temporary barriers must be positioned to prevent accidental entry. To prevent injury, caution shall be exercised when flush tanks are operated.

Treatment function requirements

The treatment function pertains to changing the characteristics of the waste by biological, chemical, or physical means. Manure and wastewater from the flush alleys, milk parlor, and milk house will be treated with a stationary, inclined-screen solid/liquid separator prior to discharge into the waste storage pond. Separated solids will be stored on an adjacent concrete pad. Manure and wastewater collected in the reception pit will be agitated and pumped to the separator once a day. Adequate ventilation must be provided before starting agitation. The rate of flow to the separator must be within the range recommended by the manufacturer. The flow must be adjusted for maximum solid separation efficiency. The screen will be given a clean-water rinse following each use to prevent solids from drying and adhering to the screen. The pump/agitator must be operated according to the manufacturer's recommendation.

The ladder attached to the tower for the solid/liquid separator shall be maintained. Workers using the ladder shall use the safety belt provided. Equipment used to move and stack the separated solids must be equipped with rollover protective structures, seat belts, and backup alarms. Equipment operators must be fully trained in safe use of the equipment.

Storage function requirements

The storage components for the system are a waste storage pond and a concrete slab for storage of separated solids. The 17 acre-foot waste storage pond was designed to provide 180 days of storage for manure and washwater. Also included in the design of the pond is a depth allowance of 2.6 feet. This allows for precipitation less evaporation anticipated for the storage period between October 15 and May 15 and for the 24-hour, 25-year storm event precipitation. The top of embankment elevation is 1.3 feet above the spillway crest, which is an allowance for the head to operate the spillway and freeboard.

The pond must be empty at the beginning of the rainy season, which is generally about October 15. The pond should fill to the elevation of the spillway crest (98.7) not sooner than April 15. To achieve this filling schedule, the approximate target elevations should be observed throughout the storage period according to the following schedule.

Filling Schedule

Date	Target elevation	Average precipitation less evaporation
October 15	90.0—Empty	5.0
November 15	91.6	6.0
December 15	93.2	6.5
January 15	94.7	5.9
February 15	96.2	4.0
March 15	97.7	2.0
April 15	98.7—Spillway crest	

Evaluation of the filling rate for the pond should consider actual precipitation less evaporation for the periods involved.

Removal of liquids before the end of the storage period may be necessary if above average precipitation has occurred and if future storms that may cause the spillway to operate are possible. Liquid must be removed to the extent necessary to allow for storage of these potential storm events. Applying liquids removed for this purpose to Pasture No. 2 during a period of good weather when soil conditions are not saturated or frozen is recommended.

The safety fence surrounding the pond shall be maintained. Entrance inside the fence must only be by those who are trained and have activities to perform. The hazard sign shall be kept in good condition. A boat will be moored and a life ring shall be placed near the pumping platform for emergency rescue.

The vegetative cover within the pond area shall be maintained by monthly mowing during the growing season. Weeds and woody vegetation will be controlled with herbicides, which must be applied according to label instructions.

The pond shall be inspected at least annually and after unusual storm events. The embankment will be inspected for leaks, slope failures, erosion, and excessive settlement. Excavated slopes will be inspected for slope failures and erosion. Repairs shall be made promptly. Assistance in planning the appropriate repairs may be requested from the Natural Resources Conservation Service.

The concrete slab for storage of separated solids will be inspected for cracking, and repairs will be made as necessary. Drains to the waste storage pond will be inspected regularly to see that they are operative.

Transfer function requirements

The transfer function applies to movement and transport of the waste throughout the system. Waste is pumped from the waste storage pond and transferred for land application using a 6-inch PVC pipeline that is buried. Valves, air vents, and other pipeline appurtenances will be inspected for proper operation prior to using the pipeline. The pipeline will be operated with a minimum pressure of 20 psi and a maximum pressure of 40 psi. To prevent solids accumulation, it will be flushed with clean water following each use. The pump must be operated and maintained according to the manufacturer's instructions. Heavy equipment will be allowed to cross the pipeline at established travelways where the pipeline has been designed for traffic loads. The pipeline will be drained at the end of each season to prevent cold weather damage.

Separated solids will be transferred using a solid manure spreader. The manure spreader must be maintained according to the manufacturer's recommendations. Equipment operated on the public road must have signs as required by local laws and regulations. Care shall be taken to minimize spillage on roadways.

Utilization function requirements

The utilization function is that part of the system that recycles reusable waste products. Wastewater from the waste storage pond and separated solids will be uniformly surface applied to 450 acres of pastures. The liquids will be applied using the sprinkler irrigation system. The separated solids will be applied using a manure spreader. Manure and wastewater will be applied only between May 15 and October 15 when the weather forecast is a high probability of 7 days without precipitation.

The nutrients available in the waste must not exceed the agronomic requirements for the yield goals of the pastures. The actual rates applied will be based on the nutrient content of the waste and soil fertility testing. See included job sheets for soil testing and manure testing.

Waste accumulated during the storage period will be applied to orchardgrass pastures beginning on or about May 15. Allowing for nitrogen losses in storage, application, and denitrification, and for the amount that will be mineralized, about 17,730 pounds of nitrogen, 7,750 pounds of phosphorus, and 31,495 pounds of potassium will be available for crop uptake from the waste storage pond. The separated solids during this same period will provide, after accounting for these same losses and for mineralization, about 6,000 pounds nitrogen, 1,940 pounds of phosphorus, and 7,870 pounds of potassium for crop uptake. The total nitrogen available for crop uptake from the waste storage pond and separated solids is 23,730 pounds or 52.7 pounds per acre for the 450 acres of pastures, 9,690 pounds or 21.5 pounds per acre of phosphorus, and 39,365 or 87.5 pounds per acre of potassium. Based on nitrogen, even application over the entire acreage will require that the wastewater from the waste storage pond be applied to 336 acres and the separated solids be applied to the remaining 114 acres.

The waste storage pond has a capacity of 17 acre-feet of wastewater. To apply this amount uniformly over 336 acres will require an application of about 0.6 inches of wastewater. The amount of solids accumulated over the storage period is estimated to weigh 2,840 tons. To apply this amount uniformly over 114 acres will require about 25 tons per acre. The attached worksheet will be used to calibrate the manure spreaders used.

Cattle will be grazed from about May 15 to October 15. It is estimated that the lactating cows will be on pasture about 50 percent of the time and the dry cows and heifers 100 percent of the time during this period. Allowing for application and denitrification losses and for the amount mineralized, it is estimated that about 21,810 pounds, or 48.5 pounds per acre of grazing applied nitrogen will be available for crop uptake. During this same period, wastewater and separated solids collected are estimated to provide, after losses and mineralization, another 8,192 pounds, or 18 pounds per acre of nitrogen uniformly applied on the 450 acres of pastures.

The total nutrients applied per acre available for plant uptake are estimated to be as follows:

	Nitrogen	Phosphorus	Potassium
Winter stored wastewater and separated solids	52.7	21.5	87.5
Grazing applied	48.5	14.1	60.4
Summer stored wastewater and separated solids	18.0	8.4	31.4
Total from waste	119.2	44.0	179.3

For a yield goal of 5 tons per acre, the orchardgrass pastures are estimated to uptake 147 pounds of nitrogen per acre, 20 pounds phosphorous per acre, and 216 pounds of potassium per acre. The waste will provide 119.2 pounds per acre of nitrogen. The deficit will require an additional 28 pounds per acre of commercial nitrogen be applied on or about July 1. No additional phosphorus is needed. An additional 37 pounds per acre of potassium will be applied with the nitrogen on or about July 1.

Guards and shields on moving parts of the pumps and manure spreader must be maintained at all times of operation. Other safety precautions must be as recommended by the equipment manufacturers.

Decisionmaker acknowledgment

I certify that this plan accurately represents my decisions for installation, operation, maintenance, and safety for my AWMS:

Joe Green, Decisionmaker Date